KuaFu Project

(Space storms, Aurora and Space Weather Explorer)

International Collaboration

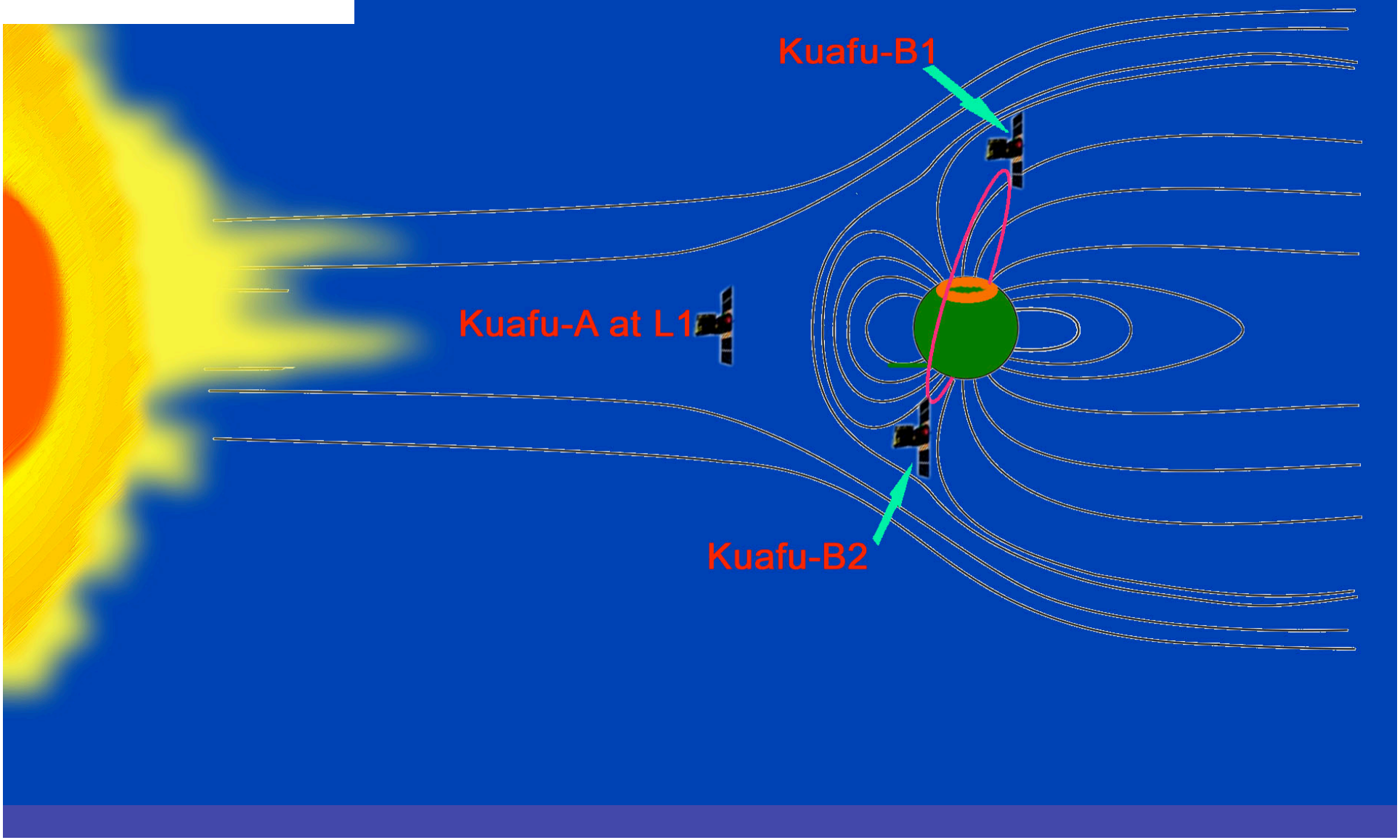
Chuan-Yi Tu[1], Rainer Schwenn[2], Eric Donovan[3]
Jing-Song Wang[4], Li-Dong Xia[5], Yong-Wei Zhang[6]
on behalf of the KuaFu study team

1. Peking University, China
2. Max Planck Institute für Sonnensystemforschung, Germany
3. University of Calgary, Canada
4. China Meteorological Administration
5. University of Science and Technology of China
6. DFH Satellite Co. LTD, China

Supported by NSFC and CNSA

The 4th ILWS General Meeting- KuaFu Collaboration

Chain of solar terrestrial disturbance



KuaFu Team members for ssment study and pre-study

Counselor: Zhen-Xing Liu Chinese Academy of Sciences

General Concept Development Group

Chuan-Yi Tu	Peking University
Yong-Wei Zhang	DFH Satellite Co. LTD
Jing-Song Wang	Peking University
	China Meteorological Administration
Li-Dong Xia	U. Science and Technology of China
Rainer Schwenn	Max-Planck Institute for SSR Germany
Eric Donovan	University of Calgary, Canada
Eckart Marsch	Max Planck Institute for SSR Germany
Zuo Xiao	Peking University
Feng-Si Wei	Chinese Academy of Sciences

Engineering Group

Yong-Wei Zhang	DFH Satellite Co. LTD (Chief)
Shi-Geng Yuan	DFH Satellite Co. LTD (System Engineer)

KuaFu A Group

L.-D. Xia	University of Science and Technology of China
R. Schwenn	Max Planck Institute for Solar System Research, Germany
P. Rochus	University of Liege, Belgium
P. Lamy	Laboratoire d'Astrphysique de Marseille, France
J.-L. Bougeret	Centre National de la Recherche Scientifique, France
U. Schühle	Max Planck Institute for Solar System Research, Germany
R. Wimmer-Schweingruber	Kiel University, Germany
K.-H. Glassmeier	Braunschweig University, Germany
C. M. Carr	Imperial College London, United Kingdom
D.-R. Lu	Chinese Academy of Sciences, China
W.-Q. Gan	Chinese Academy of Sciences, China
J. Chang	Chinese Academy of Sciences, China
S.-J.Wang	Chinese Academy of Sciences, China
L. Harra	University College of London, UK

KuaFu-B Group

J.-S. Wang	Peking University/CMA, China
E. Donovan	University of Calgary, Canada
T. –L. Zhang	Austrian Academy of Sciences, Austria
S. McKenna-Lawlor	National University of Ireland, Ireland
M. Dunlop	Rutherford Appleton Laboratory, United Kingdom
C. Jamar	University of Liege, Belgium
M. Lester	University of Leicester, UK
H.-F. Chen	Peking University, China
J. Wu	China Research Institute of Radiowave Propagation, China
A. Fazakerley	University College of London, UK
H. Reme	CESR, France

Mr. **KuaFu** is an ancient Chinese myth

One day Mr. **KuaFu** tried to catch up with the sun and to enter into it. As he was terribly thirsty, he went to drink in the Yellow River and the Wei River ,but the water in the two rivers was not enough for him, so he turned northward to the sea. Before he could reach there he died of thirst. And his stick was lost in the wild field and it grew up into a forest (Deng-Lin)."

Present Status

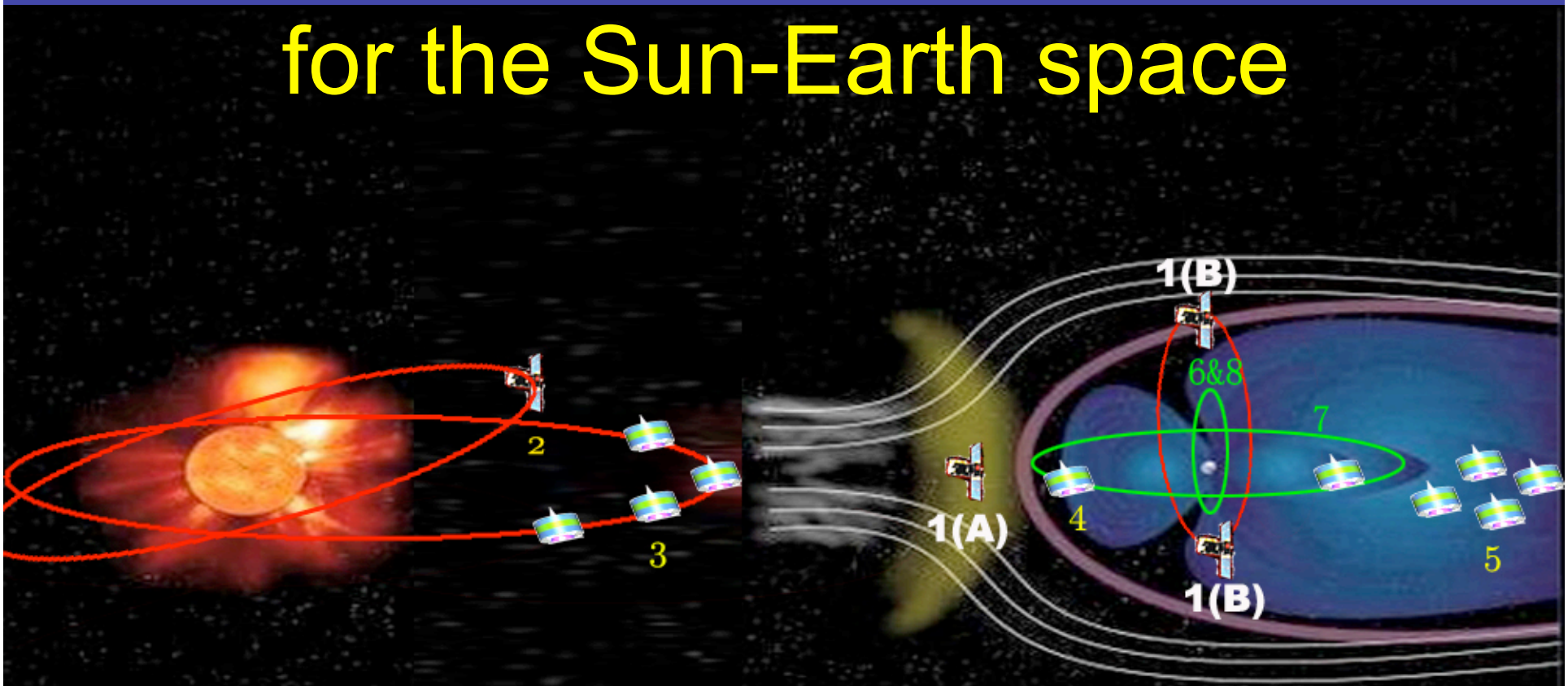
Overall system review (comprehensive review) phase supported by CNSA.

- Reviewing scientific goals and scientific instruments
- Analyzing the overall system and all the sub-systems,
- Evaluating technical feasibility
- Evaluating financial budget
- Figuring out key technical problems.

Possible time schedule

- **2006: Comprehensive Review.**
- **2007-2009: Technical Breakthrough**
  (to surmount key technical difficulties.)
- **2009-2012: Engineering Project hopefully.**
  1. the Engineering Scheme,
  2. the Test (or Prototype) Model
  3. the Flying Model.
- **2012: Launch hopefully**

Possible synergic observations with 19 satellites for the Sun-Earth space



1(A): KuaFu-A (1 S/C)

2: Solar Orbiter (1 S/C)

3: Solar Wind Sentinel (4 S/C)

1(B): KuaFu-B (2 S/C)

4: RBST (2 S/C)

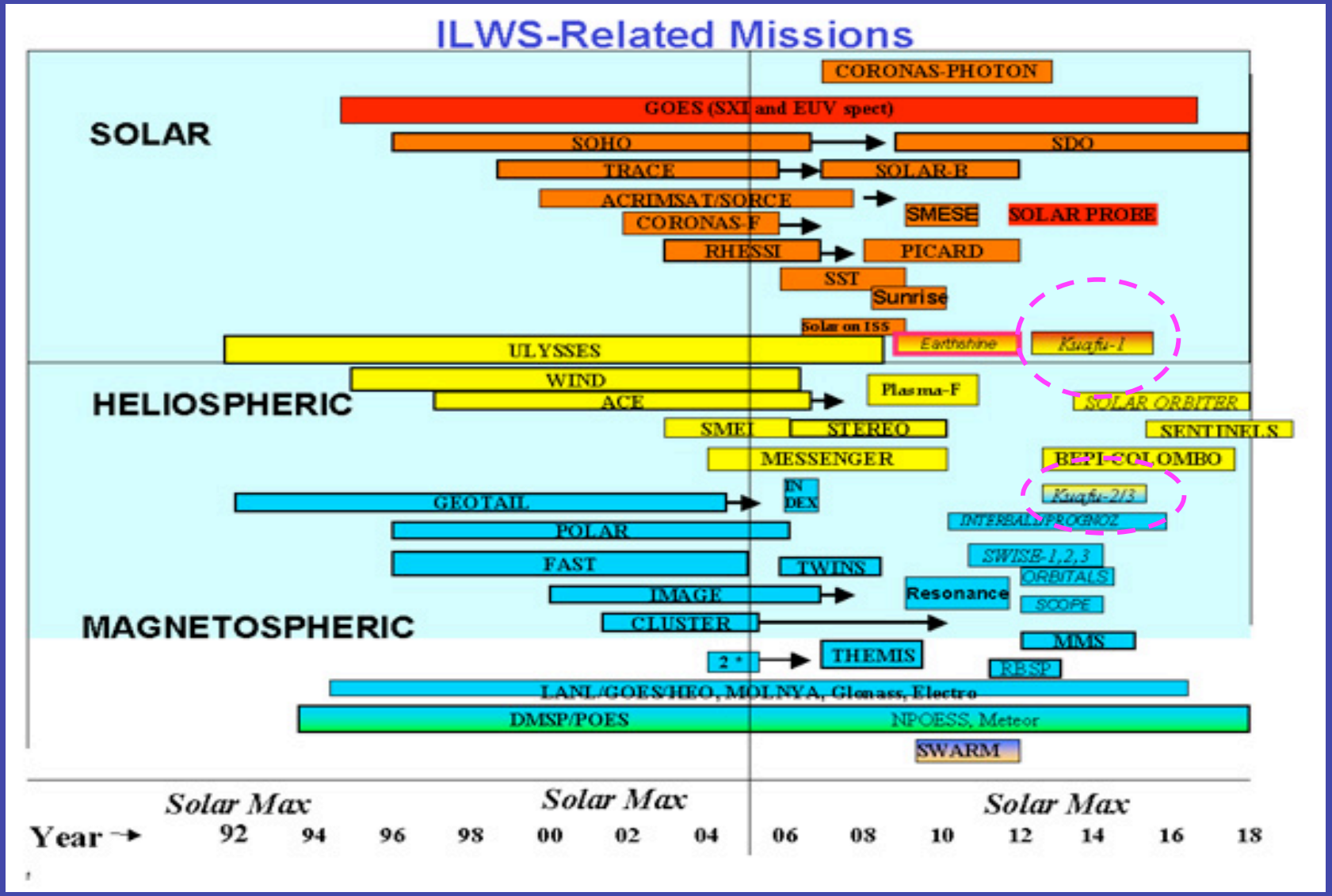
5: MMS (4 S/C)

6: FY-3 (1 S/C)

7: FY-4 (1 S/C)

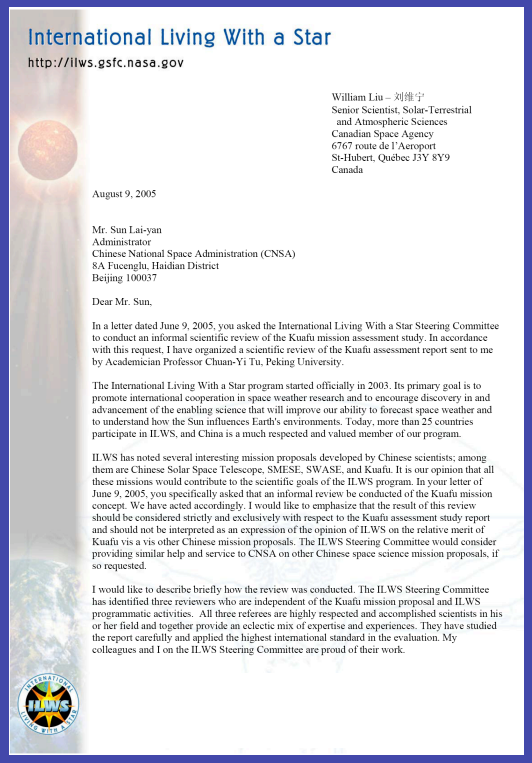
8: SWARM (3 S/C)

KuaFu in ILWS



Review of the Kuafu mission assessment report

by the International Living With a Star Steering Committee



International Living With a Star
http://ilws.gsfc.nasa.gov

William Liu – 刘维宁
Senior Scientist, Solar-Terrestrial
and Atmospheric Sciences
Canadian Space Agency
6767 route de l'Aeroport
St-Hubert, Québec J3Y 8Y9
Canada

August 9, 2005

Mr. Sun Lai-yan
Administrator
Chinese National Space Administration (CNSA)
8A Fucenglu, Haidian District
Beijing 100037

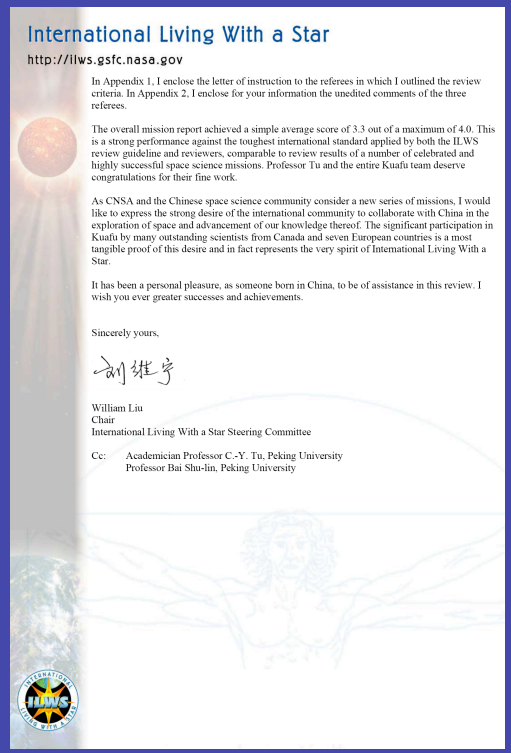
Dear Mr. Sun,

In a letter dated June 9, 2005, you asked the International Living With a Star Steering Committee to conduct an informal scientific review of the Kuafu mission assessment study. In accordance with this request, I have organized a scientific review of the Kuafu assessment report sent to me by Academician Professor Chuan-Yi Tu, Peking University.

The International Living With a Star program started officially in 2003. Its primary goal is to promote international cooperation in space weather research and to encourage discovery in and advancement of the enabling science that will improve our ability to forecast space weather and to understand how the Sun influences Earth's environments. Today, more than 25 countries participate in ILWS, and China is a much respected and valued member of our program.

ILWS has noted several interesting mission proposals developed by Chinese scientists; among them are Chinese Solar Space Telescope, SMESE, SWASE, and Kuafu. It is our opinion that all these missions would contribute to the scientific goals of the ILWS program. In your letter of June 9, 2005, you specifically asked that an informal review be conducted of the Kuafu mission concept. We have acted accordingly. I would like to emphasize that the result of this review should be considered strictly and exclusively with respect to the Kuafu assessment study report and should not be interpreted as an expression of the opinion of ILWS on the relative merit of Kuafu vis a vis other Chinese mission proposals. The ILWS Steering Committee would consider providing similar help and service to CNSA on other Chinese space science mission proposals, if so requested.

I would like to describe briefly how the review was conducted. The ILWS Steering Committee has identified three reviewers who are independent of the Kuafu mission proposal and ILWS programmatic activities. All three referees are highly respected and accomplished scientists in his or her field and together provide an eclectic mix of expertise and experiences. They have studied the report carefully and applied the highest international standard in the evaluation. My colleagues and I on the ILWS Steering Committee are proud of their work.



International Living With a Star
http://ilws.gsfc.nasa.gov

In Appendix 1, I enclose the letter of instruction to the referees in which I outlined the review criteria. In Appendix 2, I enclose for your information the unedited comments of the three referees.

The overall mission report achieved a simple average score of 3.3 out of a maximum of 4.0. This is a strong performance against the toughest international standard applied by both the ILWS review guideline and reviewers, comparable to review results of a number of celebrated and highly successful space science missions. Professor Tu and the entire Kuafu team deserve congratulations for their fine work.

As CNSA and the Chinese space science community consider a new series of missions, I would like to express the strong desire of the international community to collaborate with China in the exploration of space and advancement of our knowledge thereof. The significant participation in Kuafu by many outstanding scientists from Canada and seven European countries is a most tangible proof of this desire and in fact represents the very spirit of International Living With a Star.

It has been a personal pleasure, as someone born in China, to be of assistance in this review. I wish you ever greater successes and achievements.

Sincerely yours,

刘维宁

William Liu
Chair
International Living With a Star Steering Committee

Cc: Academician Professor C.-Y. Tu, Peking University
Professor Bai Shu-lin, Peking University

The overall mission report achieved a simple average score of 3.3 out of a maximum of 4.0. (4 – excellent, 3 – very good)

William Liu
Chair ILWS Steering Committee

Endorsement for KuaFu Payload

"The SSWG (Solar System Working Group, ESA) found the described mission concept good and noted a widespread interest within the relevant scientific community in Europe. The SSWG therefore endorses payload participation by national agencies in this mission …

------ Prof. Dr. Robert F. Wimmer-Schweingruber,
Institut fuer Experimentelle und Angewandte Physik,
University of Kiel

Suggested KuaFu Payloads (updated: July 18, 2006)

Table 1: KUAFU-A payload

Instrument		Mass(kg)	Comprehensive study	
EUV/FUV Disk Imager	EUV/FUV Imager	82.5	P. Rochus U. Schühle L. Harra	Belgium Germany UK
	MOSES			
Ly-alpha/White- Light Coronagraph	LyCo/ViCo		P. Lamy L.-D.Xia	France Italy China
Solar Wind Instrument Package (FGM+Plasma)	FGM	2.5	S. Schwartz R. Schwenn/ K.-H. Glassmeier	UK Germany
	Plasma	4.8		
Radio Burst Instrument		11	J.-L. Bougeret	France
Solar Energetic Particle Sensor		6.5	R. Wimmer- Schweingruber	Germany
High Energy Proton Detector		4.3	Y. Xu /S.-J. Wang	China
High Energy Electron Detector			Y. Wang /S.-J. Wang	China
Ion Composition Detector			S. Y. Zhang /S.-J. Wang	China
Hard X-Ray /Gamma-Ray Spectrometer		4.5	W.-Q. Gan/J. Chang	China
Solar Irradiance Measurement		13	D.-R. Lu/ W. Schmutz	China/ Switzerland
Total		~129		

Table 2: KUAFU-B1 payload

(B1 with lower energy measurements)

Instrument		Mass(kg)	Comprehensive study	
Multi-Channel Aurora Imager	UVAM C	20	E. Donovan/T. S. Trondsen	Canada Belgium UK Norway Finland
	FUVSI	20	C. Jamar	
	WFAI	2	M. Lester	
Fluxgate Magnetometer		2.5	S. Schwartz	UK
Neutral Atom Imager		6	S. McKenna-Lawlor	China/Ireland
Imaging Energetic Electron and Proton Instrument		6.4	M. Dunlop/H.-F. Chen	UK/China
Fast Plasma Pitch Angle Instrument + Ion Mass-Spectrometer		6.4 + 3.5	A. Fazakerley I. Dandouras/J.-B. Cao	France/China /UK
Total		66.8		

Table3: KUAFU-B2 payload
(B2 with higher energy measurement)

Instrument		Mass(kg)	Comprehensive study	
Multi-Channel Aurora Imager	UVAMC	20	E. Donovan/T. S. Trondsen	Canada Belgium UK Norway Finland
	FUVSI	20	C. Jamar	
	WFAI	2	M. Lester	
Fluxgate Magnetometer		2.5	S. Schwartz	UK
Neutral Atom Imager		6	S. McKenna-Lawlor	China /Ireland
High Energy Electron Detector		2.7	H.-F. Chen	China
High Energy Proton Detector		1.2	H.-F. Chen	China
Linear Energy Transfer Experiment		0.5	H.-F. Chen /Z.-X. Wu /H.-W. Xiang	China
Tri-Band Beacon		3.5	J. Wu	China
Total		58.4		

11 countries involved in collaboration for KuaFu payload Comprehensive study (Phase A)

China

- Belgium
- Finland
- France
- Germany
- Ireland
- Italy
- Norway
- Switzerland
- UK

Canada

We welcome all possible contributions to KuaFu besides payload, e.g. platform, launcher, tracking and control, data receiving, etc.

International co-operations on government-agency-level by KuaFu Coordination and Planning Committee (KCPC)

The official (KCPC) is authorized by CNSA and represents

- Chinese Meteorological Administration (CMA) coordinator
- Peking University (PKU)
- Chinese Academy of Sciences (CAS)
- China Aerospace Science & Technology Cooperation (CASC)

Chairman: Dr. Wen-Jian, Zhang

Deputy Administrator, CMA

Thank You